

# **Level 2 Strategic Flood Risk Assessment – Site LPR24**

## **Final Report**

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Prepared for:  
Hinckley and Bosworth Borough Council

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# 1 Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for site LPR24. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the Hinckley and Bosworth Level 1 SFRA and read the Hinckley and Bosworth Level 2 SFRA Main Report and is therefore familiar with the terminology used in this report.

## 1.1 Site details

- Location: Land to the south of the settlement of Desford
- Site area: 97.95ha
- Existing site use: Greenfield
- Proposed site use: Employment

## 1.2 Topography

Figure 1-1 shows the topography of the site represented by the Environment Agency (EA) 1m resolution LiDAR. The EA 1m resolution LiDAR shows that the site is predominantly at a higher elevation, before the elevation slopes downhill towards the southern site boundary. The maximum elevation is approximately 133.0mAOD to the north of the site, and the minimum elevation is approximately 106.7mAOD on the southern site boundary.

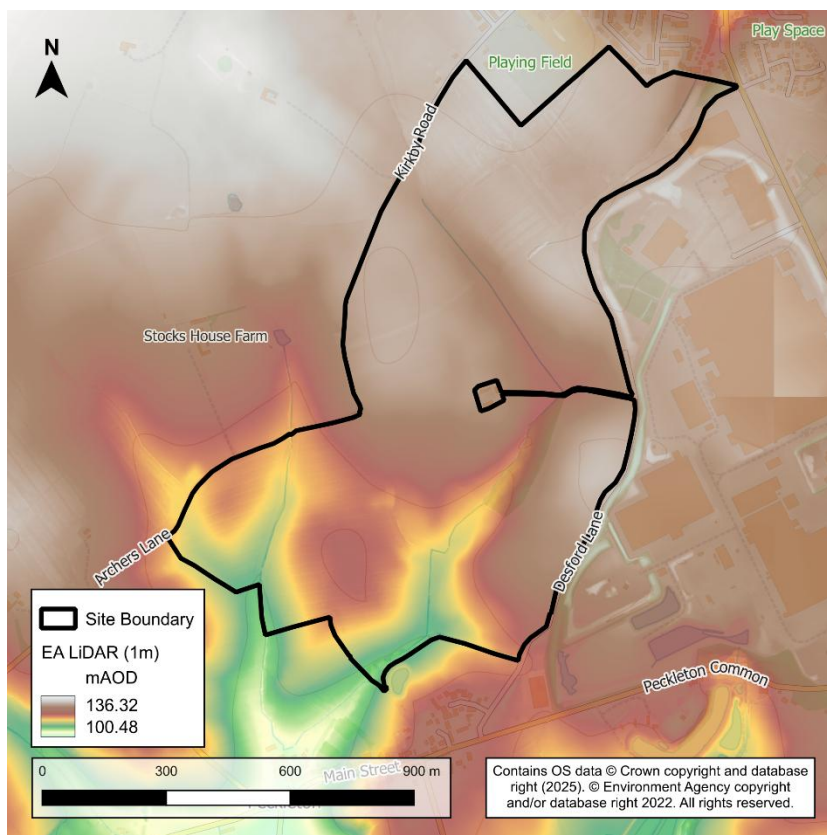


Figure 1-1: Topography of the site.

### 1.3 Geology and soils

Geology at the site consists of:

- Bedrock:
  - Edwalton Member comprised of mudstone in the north of the site.
  - Cotgrave Sandstone Member comprised of sandstone along the path of the unnamed watercourse.
  - Gunthorpe Member comprised of mudstone in the south of the site.
- Superficial deposits:
  - Oadby Till Member comprised of diamicton covers most of the site.
  - Glaciofluvial deposits, Mid Pleistocene comprised of sand and gravel bisects through the site.

Soils at the site consist of slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils

## 2 Sources of flood risk

### 2.1 Location of site within the catchment

The majority of the site is in the upstream end of Thurlaston Brook Catchment (tributary of the River Soar), in the residential area of Desford. The site is drained by several unnamed watercourses which join Thurlaston Brook approximately 2km south of the site.

### 2.2 Existing drainage features

An unnamed watercourse flows south through the centre of the site, joined at the southern site boundary by another unnamed watercourse flowing west. To the east of the site, another unnamed watercourse flows to the southern site boundary from a waterbody situated approximately 215m to the north of the eastern site boundary in Stocks House Farm. Situated adjacent to the southern site boundary is another waterbody.

### 2.3 Fluvial

#### 2.3.1 Available data

The EA's Flood Map for Planning (FMfP) has been used within this assessment to inform Flood Zones 2 and 3a.

Flood Zone 3b has been defined using the EA's Rivers and Sea 3.3% AEP defended flood risk extent.

#### 2.3.2 Description of risk to the site

The site is not shown to be at fluvial flood risk based on the EA's FMfP, however fluvial flood risk is present and is represented by the Risk of Flooding from Surface Water (RoFSW) mapping.

The unnamed watercourses site are not represented within the EA's FMfP. The risk from this watercourse has been assessed using the EA's Risk of Flooding from Surface Water Map (see Section 2.4).

### 2.4 Surface water

#### 2.4.1 Available data

The EA's Risk of Flooding from Surface Water (RoFSW) map has been used within this assessment.

#### 2.4.2 Description of risk to the site

The RoFSW mapping indicates that surface water flooding extents are primarily aligned with existing watercourses in this site.

During the 3.3%, 1%, and 0.1% AEP events, a major surface water flow path bisects the centre of the site, following the unnamed watercourse, and to the west of the site, two major surface water flow paths are present. To the north and the centre of the site, there are some instances of surface water ponding in all AEP events. The maximum depths, velocities, and hazard on the site (shown in Table 2-1) are found along the lowered topography associated with the unnamed watercourses in the south of the site. Depths across most of the site do not exceed 0.6m with maximum hazard classification of 'Danger for Most'.

Table 2-1: Existing surface water flood risk based on the RoFSW map.

| Event                           | 3.3% AEP                                  | 1% AEP         | 0.1% AEP       |
|---------------------------------|-------------------------------------------|----------------|----------------|
| Percentage of site at risk* (%) | 2.8                                       | 1.2            | 2.8            |
| Maximum depth (m)               | Exceeds 0.9m but does not exceed 1.2m     | Exceeds 1.2m   | Exceeds 1.2m   |
| Maximum velocity (m/s)          | Exceeds 1.0m/s but does not exceed 2.0m/s | Exceeds 2.0m/s | Exceeds 2.0m/s |
| Maximum hazard classification   | Danger for Most                           | Danger for All | Danger for All |

\* The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, excluding the percentage of the site at flood risk at a higher risk zone (e.g. the 1% AEP does not include the 3.3% AEP percentage).

#### 2.5 Reservoir

The site is not shown to be at risk of reservoir flooding during the 'dry day' or 'wet day' scenario from the EA reservoir flood maps.

#### 2.6 Groundwater

To the south of the site, there is a small area where groundwater is shown to be between 0.025m and 0.5m below the ground surface. In this area there is a risk of groundwater flooding to both surface and subsurface assets. There is the possibility of groundwater emerging at the surface locally. Based on the EA RoFSW mapping and topography of the site it is likely that any groundwater that emerges will flow south to the areas of lower elevation.

The JBA Groundwater Emergence Map shows that groundwater levels are at least 5m below the ground surface along the east site boundary. Flooding from groundwater is not likely in this area. The northern section of the site, the centre of the site, and an area to the

south of the site are shown to have groundwater levels between 0.5m and 5m below the ground surface. In these areas there is a risk of flooding to subsurface assets, but surface manifestation of groundwater is unlikely.

The rest of the site is not considered to be at risk of groundwater emergence due to the nature of the local geological deposits.

This assessment does not negate the requirement that an appropriate assessment of the groundwater regime should be carried out at the site-specific Flood Risk Assessment (FRA) stage.

## 2.7 Sewers

Severn Trent Water were consulted as part of the Regulation 18 process and each of the Strategic Housing and Employment Land Availability Assessment reports to provide comments on known issues of sewer flooding within or surrounding the site. The site is considered to have a potential high impact on the sewerage infrastructure as the large size of site means it will likely have an adverse impact on the downstream network and pumping station performance. Therefore, Severn Trent Water should be consulted at an early stage to discuss drainage requirements for the site.

This assessment does not negate the requirement that drainage at the site should be in line with the drainage hierarchy (see Section 6.1).

## 2.8 Flood history

The EA's Historic Flood Map shows no records of flooding at the site.

Information provided by Leicestershire County Council shows one instance of external property flooding in 2013 along The Finches to the north of the site. The source of the flooding is unknown.

## 3 Climate change

Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. Please see Section 4.6 of the Hinckley and Bosworth Level 2 SFRA report for information on climate change allowances.

Development proposals at the site must address the potential changes associated with climate change and be designed to be safe for the intended lifetime. The provisions for safe access and egress must also address the potential increase in severity and frequency of flooding.

### 3.1 Fluvial

#### 3.1.1 Available data

The EA's FMfP Flood Zones plus Climate Change layer has been used to indicate areas of the site likely to be at increased flood risk in future.

#### 3.1.2 Description of risk to the site

The EA's FMfP Flood Zones plus Climate Change layer shows the site is unlikely to be at increased fluvial flood risk in future.

The unnamed watercourses bisecting the site and to the west of the site are not represented within the EA's FMfP within the site. The future risk from this watercourse has been assessed using the EA's Risk of Flooding from Surface Water Map (see Section 3.2).

### 3.2 Surface water

#### 3.2.1 Available data

In the absence of suitable climate change data, the 0.1% AEP extent from the EA's RoFSW mapping has been used as a proxy to indicate areas likely to be at risk during the 1% AEP plus climate change event.

#### 3.2.2 Description of risk to the site

The RoFSW mapping shows that the site is sensitive to climate change. The main difference between the 1% and 0.1% AEP events is the increase in extents surrounding the unnamed watercourses within the site, and an increase in surface water ponding in the site, particularly to the centre parcel and northern parcel of the site.

The depths, velocities and hazards in the areas of risk around the watercourses in the south of the site is shown to increase between the 1% and 0.1% AEP events., indicating additional surface water hazard under future climate conditions.

## 4 Flood risk management infrastructure

### 4.1 Defences

The EA AIMS dataset shows that the site is not protected by any formal flood defences.

### 4.2 Residual risk

To the west of the site, the unnamed watercourse flows through a culvert under Archers Lane, before flowing into the site, creating a residual risk of blockage causing water to back up, overtop onto the road and flow south into the site.

Within the east of the site, the unnamed watercourse which bisects the site flows is suspected to be culverted beneath the track between Desford Lane and Broomhills Farm, with a residual risk of blockage resulting in water backing up within the site.

## 5 Emergency planning

### 5.1 Flood warnings and alerts

The site is not located in an EA Flood Warning or Flood Alert Area.

### 5.2 Access and escape

Safe access and escape routes will need to be demonstrated in the 1% AEP plus climate change fluvial and surface water events. Site drainage proposals should address the requirements for access routes, avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk elsewhere on the site and in the wider catchment.

#### 5.2.1 Potential access

Information provided by Hinckley and Bosworth Borough Council shows that access and escape to the site are currently proposed via the existing employment area to the east.

Potential access may also be provided by:

- Kirkby Road along the west site boundary.
- Desford Lane along the bottom of the east site boundary.
- Peckleton Lane at the southern site boundary.
- Archers Lane to the southwest of the site.

#### 5.2.2 Fluvial

Access and escape are not shown to be impacted during any of the available fluvial flood events, including within the Flood Zones plus Climate Change dataset.

#### 5.2.3 Surface water

Surface water flow paths divide this site into five parcels, two at the southwestern site boundary, one at the southeastern site boundary, one in the centre of the site, and the other to the north of the site, therefore access and escape to all areas of the site will need to be considered.

#### **Access and escape from the employment area to the east**

There is surface water ponding along sections of the roads within the employment area to the east which will need to be considered when planning the access and escape routes through this area. In the 0.1% AEP event there are areas of risk where depths are shown to exceed 0.3m, but not exceed 0.6m, with velocities which exceed 1.0m/s but not 2.0m/s, and a maximum hazard classification of 'Danger for Most', which may impede access and escape.

Consideration should also be given to the flow paths which divide the site. Access and escape to the north and southeastern areas of the site are likely to be possible via the

employment area to the east. Access and escape to the two southwestern site parcels and the central parcel may be impeded as depths along the flow paths which bisect the site exceed 0.3m along much of their length, with velocities exceeding 1.0m/s, and hazard classification of 'Danger for Most', which increases to 'Danger for All' in some places.

### **Other options for access and escape**

During the 3.3% and 0.1% AEP event, access to the two parcels in the southwest of the site is possible from Archers Lane. Access to the southeastern parcel is possible from Desford Lane. Access to the centre parcel of the site and the northern parcel is possible from Kirkby Road, Desford Lane, and Peckleton Lane.

During the 0.1% AEP event access is currently shown to be possible to some of the site parcels but access and escape to others is impeded:

- Access is possible to one of the southwestern parcels via Archers Lane.
- Surface water flow paths cut off access to the other southwestern parcel, with depths exceeding 0.6m, velocity exceeding 1m/s, and a hazard classification of 'Danger for All'.
- Access to the southeastern parcel is possible from Desford Lane.
- Access to the centre parcel from the south and east is likely to be impeded by surface water flow paths with a depth exceeding 0.9m, velocity exceeding 2m/s, and a hazard classification of 'Danger for All', blocking access from Kirkby Lane from the south, Desford Lane, and Peckleton Lane. However, access to the centre of the site via Kirkby Lane from the north is likely to be possible as depths along the road remain below 0.3m, with velocity below 1.0m/s, and a 'Very Low Hazard' classification.
- Access to the northern site parcel during this event is possible from Peckleton Lane, Kirkby Road, and Desford Lane.

### **5.3 Dry islands**

The site is located on a dry island.

## 6 Requirements for drainage control and impact mitigation

### 6.1 Broadscale assessment of possible SuDS

Surface water at the site should be discharged in accordance with the drainage hierarchy as set out in the [National standards for SuDS \(gov.uk\)](https://www.gov.uk/national-standards-for-suds). SuDS that provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity, should be prioritised. SuDS proposals should be discussed with relevant stakeholders (Local Planning Authority, Lead Local Flood Authority, and the EA) at an early stage to understand possible constraints.

Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site.

The potential to utilise conveyance features such as swales to intercept and convey surface water runoff should be considered. Conveyance features should be located on common land or public open space to facilitate ease of access. Where slopes are >5%, features should follow contours or utilise check dams to slow flows.

The following factors should be considered when assessing whether infiltration is suitable at the site:

- Groundwater levels are indicated to be between 0.5 and 5m below ground level and there is a risk of flooding to subsurface assets and below ground development such as basements. Groundwater monitoring is recommended to determine the seasonal variability of groundwater levels, as this may affect the design of the surface water drainage system.
- BGS data indicates that the underlying geology covering the majority of the site comprises of mudstone and is likely to be poorly draining. Any proposed use of infiltration must be supported by infiltration testing. Off-site discharge in accordance with the SuDS hierarchy is required to discharge surface water runoff.
- The site is not located within a Groundwater Source Protection Zone and there are no restrictions over the use of infiltration techniques with regard to groundwater quality.
- The site is not located within a historic landfill site.

If it is proposed to discharge runoff to a watercourse or sewer system, the condition and capacity of the receiving watercourse or asset should be confirmed through surveys and the discharge rate agreed with the asset owner (see Section 2.7).

The Risk of Flooding from Surface Water (RoFSW) mapping indicates the presence of surface water flow paths during the 3.3%, 1%, and 0.1% AEP event. The unnamed watercourses should be integrated into the site layout as blue-green infrastructure.

## 6.2 Opportunities for wider sustainability benefits and integrated flood risk management

The following are opportunities for wider sustainability benefits and integrated flood risk management at the site:

- Surface water discharge rates must not exceed the existing greenfield runoff rates for the site. Opportunities to further reduce discharge rates should be considered and agreed with the LLFA. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques.
- Opportunities to incorporate filtration techniques such as filter strips, filter drains and bioretention areas must be considered.
- Consideration should be made to the existing condition of receiving waterbodies and their Water Framework Directive objectives for water quality. The use of multistage SuDS treatment will improve water quality of surface water runoff discharged from the site and reduce the impact on receiving water bodies.

## 7 NPPF and planning implications

### 7.1 Exception Test requirements

The Local Planning Authority will need to confirm that the Sequential Test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied.

The NPPF classifies Employment development as 'Less Vulnerable'.

The Exception Test is not required for this site because the site is located entirely in fluvial Flood Zone 1 of the EA FMfP.

### 7.2 Requirements and guidance for site-specific Flood Risk Assessment

At the planning application stage, a site-specific FRA will be required as the proposed development site:

- greater than 1 hectare
- at risk of flooding from ordinary watercourse and surface water
- identified as being at increased flood risk in the future

All sources of flooding should be considered as part of a site-specific FRA.

Consultation with the Local Authority, Lead Local Flood Authority, Water Company, and the EA should be undertaken at an early stage.

Any FRA should be carried out in line with latest guidance including the National Planning Policy Framework (NPPF), Flood Risk and Coastal Change Planning Practice Guidance (PPG), and Hinckley and Bosworth Local Plan Policies.

The development should be designed with mitigation measures in place where required.

### 7.3 Guidance for site design and making development safe

The site layout must adopt a sequential approach by steering more vulnerable aspects of the development away from the areas of highest risk by the low-lying areas surrounding the unnamed watercourses and around the culverts where significant surface water risk is evident. Developers should consider utilising the land surrounding the unnamed watercourses as a green corridor or as a location for SuDS.

A detailed hydraulic model of the unnamed watercourses may be required at FRA stage to accurately represent the risk from this watercourse. Detailed survey of the culverts is likely to be required to ensure these are properly represented within the modelling.

The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as

possible to pre-development greenfield rates, with areas of surface water ponding used as open space and SuDS or water compatible/essential infrastructure uses only.

Arrangements for safe access and escape will need to be provided for the 1% AEP fluvial and surface events with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures, so development and occupants are safe.

Provisions for safe access and escape should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk.

If proposed works affect an ordinary watercourse, Leicestershire County Council as the Lead Local Flood Authority should be contacted respectively to obtain prior written consent. Any watercourses should be accommodated within the site layout and should not be culverted except for where access is required. The site layout should allow for access to any watercourse for maintenance and they should generally be located within publicly accessible areas. A buffer of at least 8 metres should be maintained between the watercourses and any built development.

## 8 Conclusions

Areas surrounding the unnamed watercourses are at risk of flooding, represented within the surface water mapping. There are three culverts within and surrounding the site, which presents a residual flood risk. The JBA Groundwater Emergence map shows instances of groundwater being within 0.5m and 5m below the ground surface and is likely to flow to the south of the site to the area of lower elevation. This initial assessment has shown that potential access and escape during all AEP surface water events is possible, apart from to a small area in the southwest in which access is blocked by surface water flow paths.

The Exception Test is not required for the sites, because they are located entirely in fluvial Flood Zone 1 of the EA's FMfP. However, a site-specific FRA will be required, because the proposed development site is greater than one hectare, is subject to ordinary watercourse and surface water flooding, and is identified as being at increased flood risk in the future

The following points should be considered in development of this site:

- A buffer of at least 8 metres should be maintained between the watercourses and any built development.
- The site layout must adopt a sequential approach by steering more vulnerable aspects of the development away from the areas of highest risk along the ordinary watercourses within the site. Developers should consider utilising these areas as green corridors.
- A detailed hydraulic model of the unnamed watercourses in the east of the site and that bisects the site may be required at FRA stage to accurately represent the risk from these watercourses and set the height of any mitigation measures. Detailed survey of the culverts within and surrounding the site is likely to be required to ensure these are properly represented within the modelling as the available flood risk mapping shows these are likely to significantly impact the flood extents within the site.
- Safe access and escape routes should be demonstrated in the 1% AEP plus climate change fluvial and surface water events. Access and escape needs to consider all parcels of the site where it is bisected by the watercourses and surface water flow paths, and several access routes are likely to be required.
- A carefully considered and integrated flood resilient and sustainable drainage design should be put forward, including a site-specific Surface Water Drainage Strategy, and SuDS maintenance and management plan and supported by detailed modelling with development to be steered away from the areas identified to be at highest risk of surface water flooding within the site.
- Flood mitigation measures should be implemented then tested to check that they will not displace water elsewhere (for example, if land is raised to permit development in one area, compensatory flood storage will be required in another).

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1 Broughton Park  
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Broughton  
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North Yorkshire  
BD23 3FD  
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+44(0)1756 799919  
info@jbaconsulting.com  
www.jbaconsulting.com  
Follow us:  

Jeremy Benn  
Associates Limited  
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3246693

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